

Remarks

Applicants request entry of foregoing amendments, entry of the attached Terminal Disclaimer, consideration of the following remarks and reconsideration of the rejections set forth in the office action mailed April 21, 2009 setting a shortened statutory period for response to expire on July 21, 2009. Claim 15 has been cancelled.

Claim 15 was rejected under 35 USC 112 as lacking sufficient antecedent basis for the phrase "m is greater than or equal to 2". Claim 15 has been cancelled.

Claims 11, 13-14 and 18-19 were provisionally rejected on the ground of nonstatutory obviousness-type double patents as being unpatentable over claim 4-5 and 8 of copending application no. 10/523481. Filed herewith is a terminal disclaimer and requisite fee.

Claims 11-28 were rejected under 35 USC 103(a) as being unpatentable over Charleux et al US 6,353,065 in view of Callais et al. '205 and further in view of Hwa et al. US 3,546,154. Applicants submit that neither Charleux et al. '065 nor Callais et al. '205 nor Hwa et al. '154 alone or in any combination render the present invention obvious.

The present invention is directed toward a process of polymerization in a microemulsion, miniemulsion or emulsion wherein the monomer to be polymerized is in the organic phase of the emulsion and the aqueous phase of the emulsion includes the water-soluble alkoxyamine of the present invention. It was discovered that the alkoxyamine of the present invention was water-soluble and would function as both a polymerization initiator as well as an emulsifying agent in such emulsions. Example 2 of the present application shows the surfactant nature (emulsifying activity) of an alkoxyamine of the present invention.

Callais et al. '205 discloses the formation of a high-solids resin for coating applications wherein the polymerization of the resin takes place in a solvent system which dissolves both the monomer to be polymerized and the alkoxyamine initiator in an organic solvent.

Applicants submit that Callais et al. '205 fails to include any indication that the alkoxyamine initiators described therein are water-soluble. The alkoxyamines disclosed by Callais et al '205 include a "Z" moiety which can be selected from: Z1 an aryl group; Z2 an ester type radical; Z3 a cyano radical or Z4 an alkyl radical. The Z group of Callais et al '205 is liberated from the alkoxyamine structure by heating to form an initiating free radical.

Applicants submit that the disclosure of Callais et al '205 of a controlled radical solution (which solution is solvent based) polymerization process in which the initiator is an N,N-dialkylamine of a structure in which the "Z" moiety is be selected from a variety of structures, fails to render obvious the process of the present invention. There is no indication in Callais et al '205 of emulsion based polymerization processes, let alone that an alkoxyamine having the specific structure of the present invention is water-soluble and able to function as both an initiator and an emulsifying agent that promotes the "mixing" of the aqueous and organic phases in the emulsion based process.

Charleux et al. '065 discloses emulsion polymerization processes in the presence of a stable free radical wherein the stable free radical can be introduced in to the polymerization medium in the form of a stable free radical or in the form of a molecule comprising a group that generates the stable free radical during the polymerization reaction. Charleux et al. '065 discloses that the stable free radical can be bonded to an emulsifying agent as a means of introducing it into the polymerization medium. The process disclosed by Charleux et al. '065 thus introduces a separate and unique surfactant or emulsifying agent to the polymerization medium in addition to the stable free radical. The present inventors discovered that the water-soluble alkoxyamine of the specified formula can act as both the polymerization initiator as well as an emulsifying surfactant in an emulsion based polymerization process, thereby reducing the components in the polymerization medium.

Hwa et al. '154 teaches the emulsion polymerization of vinyl compounds in which stable polymer lattices of very uniform polymer particle size are obtained. This purpose is achieved by means of a particular emulsifying agent, which is a short carbon chain surfactant. More precisely, the emulsifying agent is an ammonium or alkaline metal salt of an alkanoate or an alkyl sulphate or sulfonate containing between 5 and 9 carbon atoms. In Hwa et al. '154, the hydrophilic group of the emulsifying agent is an ammonium or alkaline metal salt, whereas

the hydrophobic group is a hydrocarbon chain, alkanoate or an alkyl sulphate or sulfonate containing between 5 and 9 carbon atoms. The short carbon chain of Hwa et al. '154 thus refers to the hydrophobic group of the emulsifying agent.

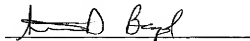
The present invention provides a polymerization process that allows the formation of copolymers possessing controlled macromolecular architectures i.e. controlled molecular weight and controlled polydispersity index. This is achieved by means of a particular water-soluble alkoxyamine. The alkoxyamine is a polymerization initiator which is water soluble. An emulsifying agent contains a hydrophilic group and a hydrophobic group. In the present invention, the alkoxyamine has a hydrophobic part (the nitroxide or SG1), and a hydrophilic part, which is the ester group, with R1 and R3 representing a linear or branched alkyl radical having a number of carbon atoms ranging from 1 to 3. The short carbon chain of the present invention is thus attached to the hydrophobic group in the alkoxyamine.

The alkoxyamine of the invention differs from the emulsifying agent in Hwa et al. '154 in that: it functions as a polymerization initiator, not an emulsifying agent; the hydrophobic SG1 as the group differs from the alkanoate or an alkyl sulphate or sulfonate hydrophobic group of Hwa et al. '154 and its hydrophilic ester group differs from ammonium or alkaline metal salt hydrophilic group disclosed by Hwa et al. '154; the short carbon chain is of the present invention is on the hydrophilic group, not in the hydrophobic group as in Hwa et al. '154; and the number of carbon atoms in the carbon chain is between 1 and 3 in the present invention, whereas in Hwa et al. '154 it is between 5 to 9.

Applicants submit that even were it obvious to combine Charleux et al. '065, and Callais et al. '205 and Hwa et al. '154, which applicants submit is not the case, the present invention is not rendered obvious. Such a combination would result in adding the emulsifying agents disclosed by Hwa et al. '154 to the polymerisation initiators of Charleux et al. '065, and/or Callais et al. '205 and not to an actual chemical modification of the polymerisation initiators. Furthermore, Hwa et al. '154, discloses a short, 5-9, carbon chain on the hydrophobic group of an emulsifying agent. The polymerisation initiator of the present invention has a shorter, 1-3, carbon chain on the hydrophobic group in the alkoxyamine initiator. The polymerisation initiators of the present invention are used in an emulsion polymerization process and allow for the formation of polymers having a controlled macromolecular architecture, i.e. controlled molecular weight distribution and polydispersity index.

Applicants submit that in view of the foregoing amendments and comments, claims 11, 13-15 and 16-28 are in condition for allowance and prompt favorable action is solicited.

Respectfully submitted,



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